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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/082,009	02/20/2002	Tsu Shih	67,200-646	1899

7590 08/23/2005

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EXAMINER	
MARKOFF, ALEXANDER	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/082,009	SHIH ET AL.	
	Examiner	Art Unit	
	Alexander Markoff	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-10 and 16-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 5-10 and 16-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 5-10 and 16-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The applicants introduced a requirement of "overlying and contacting copper oxide surface/portion".

The amendment made the claims indefinite.

As to the claims requiring "overlying and contacting copper oxide surface" it is not clear contacting of what is required. Further it is not clear how can a surface, which overlies at the same time contacts.

As to the claims reciting "portion" in addition to the deficiencies indicated above it is not clear how can a copper interconnect comprise a portion of copper oxide.

For examination purposes the claims were interpreted in view of the specification, which recite a post CMP cleaning of exposed copper interconnect surfaces covered with copper oxide.

4. Claims 1, 5-10 and 16-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The applicants introduced a requirement of "overlying and contacting copper oxide surface/portion".

The original disclosure fails to support such limitation. No "contacting" is mentioned of oxide "surface" or a "portion" with copper interconnect is mentioned by the original disclosure.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1, 5-10 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edelstein et al (any of US Patents 6,251,787 and 6,153,043) in view of Obeng et al (US Patent No 6,323,131), Zhang et al (US Patent No 6,162,301), Kneer (US Patent No 6,147,002) and the state of the art admitted by the applicants in the specification (pages 6-7, especially paragraph 009).

Edelstein et al teach a method for elimination of photo-induced corrosion and dissolution of exposed copper in CMP and post-CMP processing by shielding the processing from the light. The document disclosed shielding the light in CMP, brush cleaning, rinsing, etc. The document discloses blocking the claimed wavelength with the sufficient specificity by disclosure the range less than about 900 nm, it means that all the claimed light, which has wavelengths inside of the disclosed range, is blocked. The document teaches that the method works in presence of electrolytes.

See entire documents, especially, Abstract and Description of the Preferred Embodiments.

Thus, Edelstein et al teach a method as claimed except for specific recitation of the acidic cleaning solution and the specific pH of the solution.

The secondary references and the admitted art all teach that conventional cleaning solutions used in conventional steps of post-CMP cleaning of structures with exposed copper are acidic and have the claimed pH. The documents disclose the use of these solutions in immersing, rinsing, brush cleaning, etc., i.e. in the steps disclosed by Edelstein et al.

It would have been obvious to an ordinary artisan at the time the invention was made to apply the method of Edelstein et al on the processes of post-CMP cleaning, which utilized conventional cleaning solutions disclosed by Obeng et al, Zhang et al, Kneer and the admitted prior art with reasonable expectation of success in order to prevent etching, dissolution and corrosion of the exposed copper surfaces.

As to the presence of copper oxide: The applicants themselves admitted in the specification (paragraph 009) that CMP process leaves oxide contamination and that an acidic post-CMP cleaning solution is conventionally used to remove it. It would have been obvious to an ordinary skill in the art that at least some amount of oxide would be presented on the cooper surface after conventional CMP process and thereby during the post-CMP cleaning of the modified Obeng et al, Zhang et al, Kneer and the admitted prior.

Response to Amendment

9. Applicant's arguments filed 6/10/05 have been fully considered but they are not persuasive.

The applicant's arguments are not persuasive for the reasons of record.

The applicant's attention is again directed to the fact that the instant invention and the cited prior art document are both concerned about the same damascene, CMP and post-CMP processing of the wafers, the same specific problem – corrosion of cooper surfaces during this processing. The instant invention and the cited prior document art are both proposed the same solution to prevent such corrosion.

The secondary references are cited to show that the claimed solutions were conventional for post-CMP processing.

As to the argument that the prior art is silent regarding the presence of copper oxide: The applicants themselves admitted in the specification (paragraph 009) that CMP process leaves oxide contamination and that an acidic post-CMP cleaning solution is conventionally used to remove it. It would have been obvious to an ordinary skill in the art that at least some amount of oxide would be presented on the cooper surface after conventional CMP process.

It is further noted, that the applicants themselves state that it was known that such solution would cause erosion of the cooper surfaces. Edellstein et al address exactly the same problem – erosion of cooper surfaces in post-CMP cleaning.

The fact that the applicants use different wording compare with the prior art does not change the fact that the prior art is directed to the same stages of semiconductor manufacturing (damascene, CMP and post-CMP processing of the wafers), addresses the same problem (erosion of copper surfaces) and teaches the same solution (blocking light).

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Markoff whose telephone number is 571-272-1304. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alexander Markoff
Primary Examiner
Art Unit 1746

AM

ALEXANDER MARKOFF
PRIMARY EXAMINER